

CLAIMS

What is claimed is:

1. A method comprising:
providing a porous carrier;
5 providing an adhesive structure overlying the porous carrier;
placing a first integrated circuit die over the adhesive structure;
encapsulating the first integrated circuit die to form an encapsulated structure; and
separating the porous carrier from the encapsulated structure.
2. The method of claim 1, wherein the adhesive structure comprises an adhesive material
10 in contact with the porous carrier, and wherein the separating the porous carrier from the
encapsulated structure comprises using a solvent that is passed through the porous carrier to
affect the adhesive structure.
3. The method of claim 2, wherein the using the solvent to affect the adhesive structure
comprises using the solvent to reduce adhesive strength between the porous carrier and the
15 adhesive material of the adhesive structure.
4. The method of claim 2, wherein the adhesive material is soluble by the solvent that is
passed through the porous carrier.
5. The method of claim 1, wherein the adhesive structure comprises tape.
6. The method of claim 1, wherein the adhesive structure comprises two-sided adhesive
20 tape.
7. The method of claim 6, wherein the two-sided adhesive tape comprises a die side
adhesive material having a thickness of at least 30 microns and a carrier side adhesive
material having a thickness of at least 50 microns, wherein the carrier side adhesive material
is between the die side adhesive material and the porous carrier.
- 25 8. The method of claim 1, wherein the adhesive structure comprises photo resist.

9. The method of claim 1, wherein the porous carrier comprises at least one material selected from a group consisting of metal, ceramic, glass, plastic, and polymer.

10. The method of claim 1, wherein the porous carrier comprises aluminum oxide embedded in a glass matrix.

5 11. The method of claim 1, further comprising:
prior to the encapsulating, placing a second integrated circuit die over the adhesive structure, wherein the encapsulating comprises encapsulating the first integrated circuit die and the second integrated circuit die to form the encapsulated structure.

10 12. The method of claim 1, wherein after the separating the porous carrier from the encapsulated structure, the method further comprises:
providing a second adhesive structure overlying the porous carrier;
placing a second integrated circuit die over the adhesive structure;
encapsulating the second integrated circuit die to form a second encapsulated
15 structure; and
separating the porous carrier from the second encapsulated structure.

13. The method of claim 1, wherein the porous carrier comprises pores having a pore size diameter in a range of 0.02 microns to 30 microns.

14. The method of claim 1, wherein the porous carrier is characterized by an open
20 continuous porosity having at least a 0.02 microns diameter pore size.

15. The method of claim 14, wherein the open continuous porosity has at most a 0.3 microns diameter pore size.

16. A method comprising:
providing a porous carrier;
adhering an adhesive structure to the porous carrier;
placing at least one integrated circuit die over the adhesive structure;
5 encapsulating the at least one integrated circuit die to form an encapsulated structure;
and
removing the porous carrier from the encapsulated structure, wherein the removing
comprises using a solvent that is passed through the porous carrier to reduce
adhesive strength between the adhesive structure and the porous carrier.
- 10 17. The method of claim 16, wherein the solvent softens at least a portion of the adhesive structure.
18. The method of claim 16, wherein the solvent dissolves at least a portion of the adhesive structure.
19. The method of claim 16, wherein the removing the porous carrier is performed at a
15 temperature below a transition temperature (T_g) of an encapsulant material used in the encapsulating.
20. The method of claim 16, wherein the adhesive structure comprises a tape.
21. The method of claim 20, wherein the tape comprises a die side adhesive material having a thickness of at least 30 microns and a carrier side adhesive material having a
20 thickness of at least 50 microns, wherein the carrier side adhesive material is in contact with the porous carrier.
22. The method of claim 16, wherein the placing at least one integrated circuit die over the adhesive structure comprises placing a plurality of integrated circuit die in an array configuration over the adhesive structure, and wherein the encapsulating comprises
25 encapsulating the plurality of integrated circuit die.
23. The method of claim 16, wherein the porous carrier is be reusable.

24. The method of claim 16, wherein the porous carrier comprises pores having a pore size diameter in a range of 0.02 microns to 30 microns.

25. The method of claim 16, wherein the porous carrier is characterized by an open continuous porosity having at least a 0.02 microns diameter pore size.

5 26. The method of claim 25, wherein the open continuous porosity has at most a 0.3 microns diameter pore size.

27. The method of claim 16, wherein the porous carrier comprises at least one material selected from a group consisting of metal, ceramic, glass, plastic, and polymer.

10 28. The method of claim 16, wherein the using the solvent that is passed through the porous carrier comprises placing at least a portion of the porous carrier into a bath having the solvent wherein the solvent is absorbed through the porous carrier via capillary action.

29. The method of claim 16, wherein the placing the at least one integrated circuit die over the adhesive structure comprises:

15 placing the at least one integrated circuit die over a package substrate; and
placing the package substrate over the adhesive structure.

30. A method comprising:

providing a reusable porous carrier including pores with a pore size diameter of at least 0.02 microns;

adhering an adhesive structure to the reusable porous carrier;

20 placing a plurality of integrated circuit die in an array configuration over the adhesive structure;

encapsulating the plurality of integrated circuit die to form an encapsulated structure; and

25 separating the reusable porous carrier from the encapsulated structure, wherein the separating comprises using a solvent that is passed through the porous carrier to reduce adhesive strength between the adhesive structure and the reusable porous carrier.

31. The method of claim 30, wherein after the separating, the method further comprises:
adhering a second adhesive structure to the reusable porous carrier;
placing a second plurality of integrated circuit die over the second adhesive structure;
encapsulating the second plurality of integrated circuit die to form a second
5 encapsulated structure; and
separating the reusable porous carrier from the second encapsulated structure.

32. The method of claim 30, wherein the reusable porous carrier comprises at least one
material selected from a group consisting of metal, ceramic, glass, plastic, and polymer.

33. The method of claim 30, wherein the reusable porous carrier comprises aluminum
10 oxide embedded in a glass matrix.

34. The method of claim 30, wherein the reusable porous carrier is characterized by an open
continuous porosity having at most a 0.3 microns diameter pore size.

35. The method of claim 30, wherein the separating is performed at a temperature of at
most 90 degrees Celsius.